Research and Pedagogy for our Science Curriculum

Rationale

To write an effective pedagogy for the bespoke science curriculum at Heygarth Primary School, we must first consider what we understand by the term, 'pedagogy' In the words of James and Pollard: 'pedagogy' expresses the contingent relationship between teaching and learning... and does not treat teaching as something that can be considered separately from an understanding of how learners learn' (James & Pollard, 2011:280).

In planning our science curriculum, serious consideration was given to pupil voice. Conversations began in April 2019 with a class of Year four learners about how they felt about science and how we could improve it. Evidence from the teaching and learning research programme (TLRP) on consulting pupils (TLRP, 2011) suggests that pupils respond with insight and intelligence when consulted meaningfully. To build on this, we now have a group of Science Ambassadors across Key Stage Two. This allows us to understand the experience of pupils.

Pedagogy

Bruner identified that **learning occurs through enactive means** (doing, which is action based), iconic means (seeing, which is visual) and symbolic means (abstract, which is in the form of 'codes' or symbols i.e., language). This Concrete, Pictorial, Abstract (CPA) approach lies at the heart of Maths No Problem and our science curriculum. Starting lessons with misconceptions to disprove. Ofsted Research Review published in April 2021 states, "Research shows that experts are better than novices at suppressing misconceptions, as opposed to not having them." The implications of this for curriculum design are twofold. First, pupils will not only need to know why a scientific idea is correct, they will also need to know why their misconception (prior knowledge) is scientifically wrong."

At Heygarth Primary School, we understand that quality first teaching in science needs to provide a balance of different approaches. Research and analysis from Ofsted April 2021 states, "Clear teacher explanations form an important part of teacher-directed instruction. Indeed, pupils report that 'explaining things well' is the most important thing that science teachers do to help them learn". We also ensure that pupils are carefully guided to explore concepts as an absence of support can lead to 'heavy cognitive load'. Taking research in to account, we teach science using a variety of approaches:

- directing and telling
- demonstrating
- explaining and illustrating

- questioning and discussing
- exploring and investigating
- consolidating and embedding
- reflecting on and talking through a process
- reflecting and evaluating
- summarizing and reminding
- guided learning

Scientists and contemporary issues

Contemporary issues in science are often linked to famous scientists and their work. That work may be either contemporary or historical, but the application or impact can be seen today. It is important that pupils are aware that the scientific issues which are relevant to current society have their roots in earlier discoveries which led us to our present state of understanding about a particular concept. Pupils should also be made aware that future discoveries may take our understanding further forward and may change the currently held view of a particular concept or idea. By considering the role of science in contemporary issues, we engage pupils in the thought process which has engaged scientists through the ages. This in turns enables them to question the scientific information presented to them (sometimes as apparent scientific fact) and to make their own judgement about its worth.

Group talk and argument and Questioning

Assessment for learning- at the beginning and throughout every lesson- Effectively reveals the progress of the pupil to the teacher, encouraging the pupil to self- and peer-assess while allowing the teacher to plan more effectively and to respond in the moment.

Higher Level Thinking - Pupils are challenged to defend, review, and modify their ideas with their peers. It encourages reflection and metacognition (thinking about one's own thinking). Pupils often communicate ideas better with other pupils than with teachers.

Illustrating science in action Working scientists use group talk – in class it models how they work, supporting the teaching of the 'ideas and evidence' aspects of scientific enquiry.

Developing the whole child, the ability to resolve disagreements is a life-skill. Pupils become more reflective as they try to arrive at a consensus by expressing different points of view; or work collaboratively to explore ideas, plan, and make decisions. Further, it supports the development of oracy.

Variety and learning styles Can be used as an alternative to written or practical work (for example, experiments), or just listening as the teacher explains and demonstrates.

Group talk encourages the use of different learning styles and thus can be inclusive to pupils excluded from more traditional (and often written) activities. It can support with ideas.

Science Lead

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